Wireless Modbus I/O

Model Numbers

MDR4241A MDR4242A
MDR4243A MDR4244A
MDR4901A MDR4902A
MDR4903A MDR4904A
MDE01A MDE02A MDE03A
MDE04A MDE05A MDE06A
MDE07A MDE08A
MDP01 MDP02

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Chapter 1: Introduction

Thank you for purchasing an I/O product! This product has been manufactured to the highest standards of quality and performance to ensure your complete satisfaction.

About this Manual

This manual has been created to assist you in installing, configuring and using your I/O module. Please read it carefully and follow the instructions to achieve best results.

I/O Product Family

Wireless Modbus I/O modules provide easy-to-use, cost-effective peer-to-peer or Modbus wire-replacement solutions.

Figure 1. An MDR4241A Module

The I/O family of products features a selection of operational modes, communications ranges and I/O combinations. The system is scalable making it easy to start with a few I/O points and build a system with the required I/O mix.

Features

- Choice of number and type of digital and analog I/O
- Sourcing or sinking digital outputs available
- Flexible and scalable by adding expansion modules
- Wireless MODBUS and Peer-to-Peer communications modes
- Small, economical and configurable
- Wide operating temperature range
- AC or DC power sources
- Three radio options for different range capabilities
- Power, RSSI, RF Data and Bus LED's
- Removable screw terminal strips for power supply and I/O points
- I/O Manager configuration software
- DIN rail mountable

Package Checklist

Base Modules are shipped with the following items included:

- ✓ I/O module
- ✓ a printed version of this user manual
- ✓ a printed version of the I/O Quick Start Guide

Expansion Modules are shipped with the following items included:

- ✓ I/O module
- ✓ a printed version of the I/O Quick Start Guide

Programming Modules (MDP01) are shipped with the following items included:

- ✓ MDP01 Programming Module
- ✓ 6 foot DB9 male to DB9 female straight-through serial cable
- ✓ a printed version of the I/O Quick Start Guide

Programming kits (MDP02) are shipped with the following items included:

- ✓ MDP01 Programming Module
- ✓ 6 foot DB9 male to DB9 female straight-through serial cable
- ✓ a printed version of the I/O Quick Start Guide
- ✓ a CD-ROM disc with
  - o I/O Manager configuration software
  - o I/O Firmware Updater
  - o this manual in .PDF format
  - o a Quick Start guide in .PDF format

Chapter 2: Hardware

Wireless Modbus I/O encompasses a growing family of products including Base Modules, Expansion Modules, Programming Modules, configuration software and accessories. All modules are built into similar enclosures featuring male local bus plugs and female local bus receptacles on the sides, which allow modules to connect together. Modules are DIN rail mountable and feature removable screw terminal blocks.

I/O Modules

I/O systems consist of Base Modules and Expansion Modules. These modules are configured using a Programming Module, connected to a PC and running I/O Manager software. I/O systems can operate in Modbus or Peer-to-Peer modes. In Modbus mode an I/O system exchanges Modbus messages with a Modbus radio modem. In Peer-to-peer mode two I/O systems provide wire-replacement functionality. Some Base Modules can also be used as repeaters, to extend the communication distance of a system.

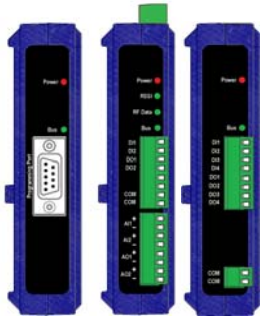

Figure 2. Front View of I/O Programming, Base and Expansion Modules

Base Modules

Each I/O system is built around a **Base Module**. Base Modules provide digital and/or analog I/O and radio communications with other nodes.

Figure 3. A Typical Base Module

Radio options include two frequency bands (900 MHz and 2.4 GHz) and three power output/range categories: Short Range, Medium Range and Long Range.

Frequency Band	Range Category	Indoor	Outdoor (Line of Sight)
2.4 GHz	Short Range (SR)	300 ft	1 mile
2.4 GHz	Medium Range (MR)	600 ft	3 miles
900 MHz	Medium Range (MR)	1500 ft	7 miles
900 MHz	Long Range (LR)	3000 ft	14 miles

Figure 4. Radio Type Options and Ranges (with included antennas)

Several different combinations of digital inputs (DI), digital outputs (DO), analog inputs (AI) and analog outputs (AO) are available. For example, the MDR4241A features a combination of two DI's, two DO's, two AI's and two AO's in a package with a short range (SR) 2.4 GHz radio option. Similar models are available with medium range (MR) and long range (LR) radio options.

Expansion Modules

Up to six **Expansion Modules** can be plugged into the Base Module to add more I/O capabilities in any combination needed. For example, the MDE02A

Expansion Module provides eight additional digital outputs; the MDE06A provides two analog inputs and two analog outputs.

Refer to Appendix E for a list of I/O models and features.

Expansion Modules connect to Base Modules by plugging the modules together, engaging the local bus connectors located on the sides of the boxes. Male plugs on Expansion Modules plug into female connectors on the side of the Base Module or other Expansion Modules, resulting in a horizontal "stack" with the Base Module on the left and Expansion Modules extending to the right.

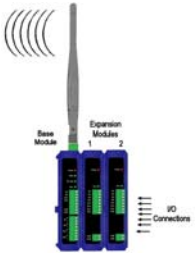

Figure 5. Base and Expansion Modules Connected Together

Programming Module

The MDP01 **Programming Module** provides a convenient way to interface Base and Expansion Modules with a PC and the software used to configure them. The Programming Module plugs into a Base or Expansion Module. The Programming Module connects to a PC serial port (COM1 to 16) using a standard straight-through 9-pin serial cable.

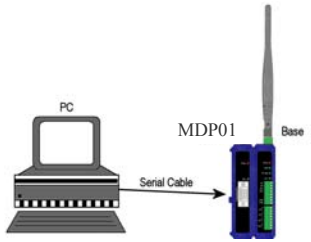

Figure 6. A PC, Programming Module and Base Module

Indicators, Connectors and Accessories

LED Indicators

Base Modules have four LED indicators: a Power LED, an RSSI LED, a Wireless Data LED and a Local Bus Data LED.

Expansion Modules and Programming Modules have two LED's: a Power LED and a Local Bus Data LED

Power LED

The **Power** LED illuminates (red) immediately on power up indicating that AC or DC power is present on the power supply terminals.

RSSI LED

The **RSSI** LED provides an indication of the signal strength of the received radio signal. The color of the LED indicates whether the signal is weak, OK or strong.

LED Color	Signal Strength
Off	No signal
Red	Weak
Yellow	OK
Green	Strong

Figure 7. RSSI LED Status Table

RF Data LED

The **RF Data** LED blinks (green) when data is being transmitted or received on the radio link. When the LED is off no data is being transmitted or received.

Bus LED

The **Bus** LED blinks (green) when data is being transmitted or received on the local bus connection. When the LED is off no data is being transmitted or received.

Note: If communications is not established within a preset number of retries (default is 10) the RF Data and Bus LED's blink alternately to indicate a loss of communications.

Antennas

Base Modules operating in the 900 MHz band come equipped with 6.5-inch folding rubber duck antennas that screw onto the reverse SMA connector on top of the case. Base Modules operating in the 2.4 GHz band come equipped with 4.25-inch, folding rubber duck antennas. Higher gain antennas may be connected to extend range.

Connectors

I/O Base and Expansion Modules feature connectors for connecting field I/O wiring and plugging together I/O modules (local bus). In addition, Base Modules include connectors for connecting an antenna and power supply. Programming Modules include a serial connector for connecting to a PC COM port.

Antenna Connector

Base Modules have a reverse SMA antenna connector mounted on the top edge of the enclosure.

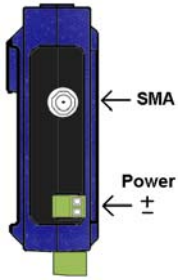

Figure 8. Top View of a Base Module

Power Supply Connector

The **Power Supply** connector (Base Modules only) is a two-position removable terminal block located on the top of the unit. Terminal spacing is 3.5 mm. The terminal block accepts solid and stranded wires from 28 AWG to 16 AWG. **Please check polarity marking in Figure 8.**

Refer to the following section for information on Power Supply Requirements.

The Programming Module and all Expansion Modules receive power from the Base Module via the local bus connector.

Serial Port Connector

The **Serial Port** connector (Programming Module only) is a DB-9F (female) connector. The Programming Module is configured as a DCE device and supports standard RS-232 serial communications signal levels. For programming, a standard straight-through serial cable with DB-9F on one end and DB-9M on the other is required.

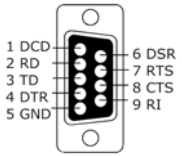

Figure 9. DB-9 Female Serial Port Connector with Pin-out

Local Bus Connectors

The **Local Bus** connectors are included on Base, Expansion and Programming Modules. These connectors are dual row, 14 pin (2 mm spacing) connectors, male on one side of the module and female on the other. Modules are plugged together to supply power and facilitate communication between modules.

When adding an Expansion Module to a Base Module the male connector on the Expansion Module plugs into the female connector on the Base Module. The second Expansion Module plugs into the first, and so on, up to a maximum of six Expansion Modules.

Figure 10. Local Bus Connector

On the Programming Module, either Local Bus connector (male or female) can be used to plug into Base or Expansion Modules.

I/O Connectors

I/O connectors for Base and Expansion Modules are removable (plug in) screw terminal blocks located on the front of the unit. Terminal spacing is 3.5 mm. Depending on the specific model, the number of terminals may vary. The maximum is 16 terminals (two 8-terminal blocks).

Power Supply Requirements

I/O systems can be powered from DC or AC power sources. No supply is included since the power rating of the supply will depend on the total power requirements of all modules used in the system.

Appendix B contains a listing of power requirements for all I/O modules.

If an AC power supply is to be used, it should be 24VAC.

If a DC power supply is to be used, it is important to note whether the system will include DO's with sourcing outputs.

- Systems which incorporate DO's with **sourcing** (PNP transistor) outputs on the Base Module or any Expansion Modules must be powered with a supply voltage range of 10 to **46 VDC maximum**.
- Systems in which all digital outputs have **sinking** (NPN transistor) outputs on the Base Module and **all** Expansion Modules (no sourcing drivers) can be powered with a supply voltage range of 10 to **48 VDC**.

Refer to the I/O Options and Characteristics section for more information on sourcing and sinking outputs.

Mounting Hardware

I/O modules can be DIN rail mounted. The DIN mounting clip and spring is included on each module.

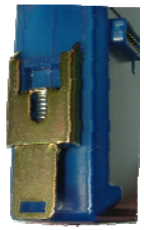

Figure 11. DIN Clip with Spring on a I/O Module

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I/O Options and Characteristics

I/O Options

The Wireless Modbus I/O family of products features a variety of input and output options. Base and Expansion Module options include:

- 2 analog inputs, 2 analog outputs, 2 digital inputs and 2 digital outputs (sourcing or sinking driver)
- 4 digital inputs and 4 digital outputs (sourcing or sinking driver)
- 8 digital inputs
- 8 digital outputs (sourcing or sinking driver)
- 4 analog inputs
  - RTD Temperature input module available
- 4 analog outputs
- 2 analog inputs and 2 analog outputs

(Modules continue to be developed with additional features and options.)

Refer to Appendix E for a list of available models and options.

I/O Types and Characteristics

Digital Inputs

DI's can detect the presence of contact closures, transistor switches or on/off DC voltage signals (low or high logic levels). Voltages below 0.8 VDC are interpreted as a low state. Voltages between 4.0 VDC and 48 VDC are interpreted as a high state.

Note: Inputs have an internal "weak" pull-up resistor so unconnected inputs will read as being in the high state.

Digital Outputs

Digital outputs send on/off signals (low or high logic levels) to drive external devices such as indicators, relay coils or the inputs of other equipment such as PLC's, SCADA, etc. Modules with digital outputs are available with sourcing or sinking drivers.

Sourcing (PNP transistor) drivers provide up to 40 mA per output (or 320 mA total for an 8 DO modules) at output voltages up to 45 VDC to connected loads.

Sinking (NPN transistor) drivers can sink up to 40 mA per output (or 320 mA total for an 8 DO module) at voltages up 48 VDC.

Analog Inputs

Analog inputs accept voltage, current signals, or RTD temperature signals. When configured as voltage inputs the full scale range is 0 to 10 VDC. When configured as current inputs the full scale range is 0 to 20 mA and the input resistance is 250 ohms. When configured as RTD input the range is PT100, PT1000, CU10 types.

Analog Outputs

Analog outputs produce voltage or current output signals. When configured as voltage outputs the full scale range is 0 to 10 VDC at 1 mA maximum. When configured as current outputs the full scale range is 0 to 20 mA with a maximum load resistance of 450 Ω at 20 mA.

0 to 20 mA AI's and AO's accommodate standard 4 to 20 mA instrumentation current loop signals.

I/O Wiring

DI Wiring

The following diagram shows typical connection wiring for various digital inputs:

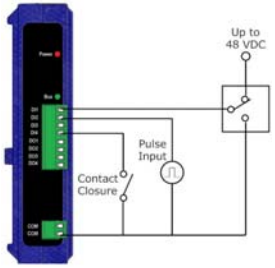

Figure 12. Typical Digital Input Wiring for Various Input Devices (MDE03A Expansion Module)

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Note: No external power supply wiring is required for Expansion Modules

DO Wiring

The following diagram shows typical connection wiring for modules featuring **sourcing (PNP) drivers**:

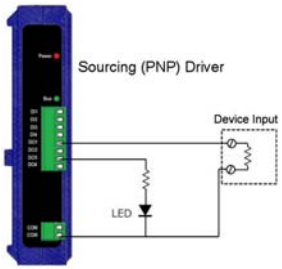

Figure 13. Typical Digital Output Wiring for Sourcing Outputs (MDE03A Expansion Module)

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The following diagram shows typical connection wiring for modules featuring **sinking (NPN) drivers**:

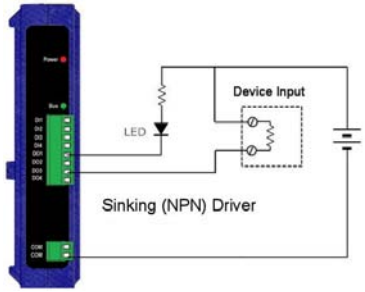

Figure 14. Typical Digital Output Wiring for Sinking Outputs (MDE03A Expansion Module)

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AI Wiring

The following diagram shows typical connection wiring for analog inputs:

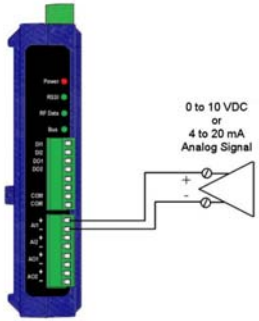

Figure 15. Typical Analog Input Wiring (MDR4901A Base Module)

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AO Wiring

The following diagram shows typical connection wiring for analog outputs:

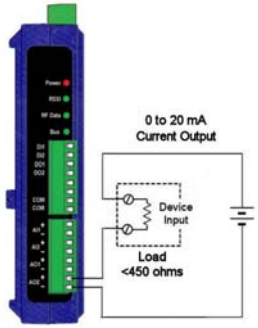

Figure 16. Typical Analog Output Wiring (MDR4901A Base Module)

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RTD Wiring

The following diagram shows typical connection wiring for RTD inputs.

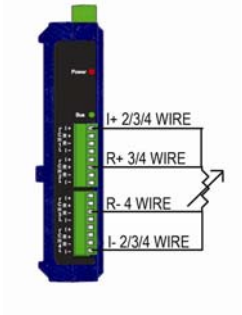


Figure 17. Typical RTD Input Wiring

Modbus I/O Addressing

I/O modules can be configured to operate as wireless Modbus nodes. In Modbus mode messages are sent across the wireless link from a Modbus modem to the I/O and from the I/O to the Modbus modem. Digital and analog input information from the I/O inputs is stored in the I/O memory and then sent across the link to the Modbus modem. Digital and analog output information is sent from the Modbus modem to the I/O, stored in its memory and then sent to the outputs.

To use Modbus mode successfully, an understanding of the I/O memory map assignments is necessary.

Modbus fundtion codes supportd are:

Function 1: Read DO Status
Function 2: Read DI's
Function 3: Read AO Status
Function 4: Read AI's
Function 6: Write to Single AO
Function 15: Write to Multiple DO's

Messages sent between I/O and a Modbus modem use Modbus memory addresses to specify what type of information is being sent and where it is stored. In the Modbus addressing scheme each type of I/O (DO, DI, AI and AO) is stored in a different section of the memory.

I/O Type	Modbus Memory Address
DO	00001 to 00112
DI	10001 to 10112
AI	30001 to 30112
AO	40001 to 40112

Figure 18. I/O Memory Areas Table

Within these sections, addresses are reserved for all I/O modules that may be used.

Module	Memory Range
Base	x0001 to x0016
Expansion 1	x0017 to x0032
Expansion 2	x0033 to x0048
Expansion 3	x0049 to x0064
Expansion 4	x0065 to x0080
Expansion 5	x0081 to x0096
Expansion 6	x0097 to x0112

Figure 19. Module I/O Addressing Table

The following examples show how the addressing works:

Example 1: To turn on the second digital output (DO2) on the Base Module, the Modbus modem sends a message placing a logic 1 in memory location 00002.

Example 2: To cause Expansion Module 3 to output a specified voltage on AO1, the Modbus modem sends a message to set the register at Modbus address 40049 to the appropriate value.

A list of all Modbus address assignments for all I/O points is shown in Appendix D. Several important points about this list should be noted:

- Some addresses are listed but not implemented in current versions of I/O hardware.
- Some addresses are reserved for internal I/O use.
- Some addresses are reserved for future use.
- 40000 series addresses store Analog Output data AND Frequency Counter data when Digital Inputs are configured for Frequency Counter operation. For each module, the first eight memory locations are assigned to AO data and the next four locations are assigned to Frequency Counter data.
- If a Modbus device communicating with I/O tries to send to or receive from a memory address not implemented by the hardware in use, the I/O replies with an exception response.

Appendix D of this manual contains a list of Modbus I/O assignments for the I/O.

I/O Modes of Operation

I/O systems can operate in Peer-to-Peer or Modbus modes. Some Base Modules can be configured as repeaters to extend the radio coverage distance.

Peer-to-Peer Mode

In Peer-to-Peer mode two I/O systems provide wire replacement functionality. In this mode one Base is configured as the master and the other as the slave. (It does not matter which end of the link is the master and which is the slave.) Both Base Modules must be the same model. Analog and digital input signals connected to AI's and DI's on one module appear on the corresponding AO's and DO's on the other module. Any Expansion Modules included in a Peer-to-Peer system must be chosen to be complimentary. For example, if Expansion Module 1 on one end of the link is a MDE04A (4 analog inputs), Expansion Module 1 on the other end of the link must be a MDE05A (4 analog outputs).

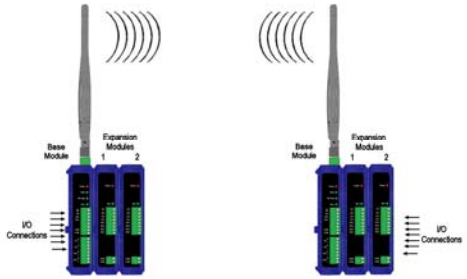


Figure 20. Peer-to-Peer Mode

Modbus Mode

In Modbus mode standard Modbus messages can be sent and received between a Modbus radio modem and a I/O system. Data written to output addresses in the I/O result in signals appearing on its outputs. Signals connected to I/O inputs are converted and stored in Modbus input memory locations and then sent across the link as Modbus messages to the Modbus radio modem.

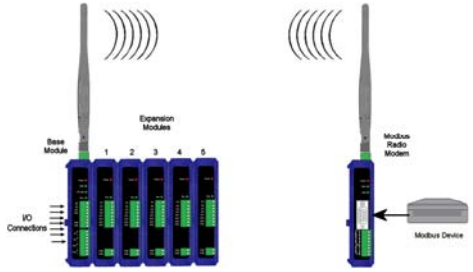


Figure 21. Modbus Mode

Repeater Mode

When a I/O Base Module is configured as a radio repeater it relays data (from a Modbus modem or another I/O Base Module) and extends the range of communication.

Figure 22. Using a Base Module as a Repeater

Chapter 3: Getting Started

I/O Installation

RF Site Considerations

When installing any radio equipment it is important to give careful consideration to the installation location and the surrounding area. Radio transmission and reception is affected by absorption, reflection and refraction of the radio signals. These factors are determined by the distance between the transmitting and receiving antennas, the type, position and amount of obstructions, antenna heights, frequency band and RF power used, and other factors.

There are several ways to optimize the RF environment to ensure satisfactory performance. A partial list of these follows:

- Select the I/O radio option that provides sufficient power for your application. Lower frequencies travel farther and are less affected by absorption in materials. Higher power levels generally provide greater penetration through objects.
- Select installation locations that come as close as possible to providing LOS access between Base Modules.
- Avoid installation locations where metal objects may block, reflect, refract or cause multipathing of radio frequencies. (In some cases reflections may enhance reception but in others it can cause problems. Some experimentation may be necessary.)
- Select installation locations to increase antenna heights.
- Select equipment enclosures made of materials that minimize RF attenuation.
- Avoid locations with other radio equipment that may cause interference.
- In some cases alternate types of antennas (more directional) or remote antenna mounting (outside of enclosures or at a higher elevation) may be required.

Most importantly, some research and testing of the proposed installation location(s) should be carried out. Sometimes small changes in location can make a significant improvement to coverage.

Computer System Requirements

The I/O Manager software requires the following computer hardware and operating systems:

- A PC with one serial port available between COM1 and COM16
- Windows XP (Home or Professional with SP1 and SP2), Windows 2000 (with SP4), Windows 98 (SP1, Second Edition) or Windows ME

Installing I/O Software

To install the **I/O Manager** software:

1. Insert the CD included with your I/O product into the CD ROM drive of your PC.
2. The installation should launch automatically. If not:
   a. Click **Start** on the Task Bar and select **Run**
   b. Type in *[CD drive letter]:\setup.exe*
3. Follow the prompts to install the software.

   When installation is complete I/O Manager, I/O Firmware Updater, and .PDF files containing this manual and the Quick Start Guide are accessible from the Windows Start menu.

Connecting I/O to a PC

1. With power disconnected from the Base Module, plug the MDP01 Programming Module into the Base Module.

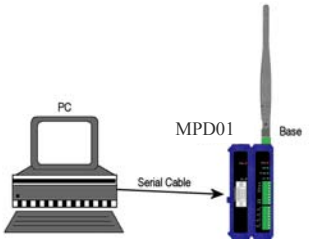


Figure 23. A PC, Programming Module and Base Module

2. Connect any required Expansion Modules to the Base Module. (The male local bus connector on the first Expansion Module plugs into the female connector on the Base Module. The second Expansion Module plugs into the first, etc.)

3. Connect the PC serial port to the Programming Module using a straight-through serial (9 pin) cable.

4. Re-apply power to the I/O Base Module. The Power LED should light up.

Starting I/O Manager

1. From the Windows Start menu, start the I/O Manager software.

   The I/O splash window appears briefly, followed by the discovery window.

2. The Connection drop down list defaults to **Automatic** discovery. The software scans through COM ports looking for I/O devices. The scan

starts with the most recently used serial port in which a device was found.

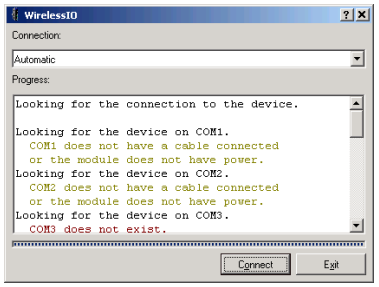

WirelessIO
Connection:
Automatic
Progress:
Looking for the connection to the device.
Looking for the device on COM1.
COM1 does not have a cable connected
or the module does not have power.
Looking for the device on COM2.
COM2 does not have a cable connected
or the module does not have power.
Looking for the device on COM3.
COM3 does not exist.
Connect
Exit

Figure 24. Discovery Window

During the scan the Progress box displays information about the scanning process. If a device is not found at the most recently successful port it continues to scan through COM ports 1 to 16. The bar graph near the bottom of the window indicates progress.

3. If the device is not found the Progress box displays:

   ```
   The device was not found on any serial port.
   ```

   a. Check the power supply and serial cable connections

   b. Click the Connect button. The connection process will be repeated and the device should be found.

4. If Automatic connection is not desired, a particular COM port (1 to 16) can be specified:

   a. Select the COM port number from the Connection drop down list.

   b. Click the Connect button to initiate the connection process.

Clicking the Stop button stops the module discovery process.

5. If the device is found, the I/O Manager window opens.

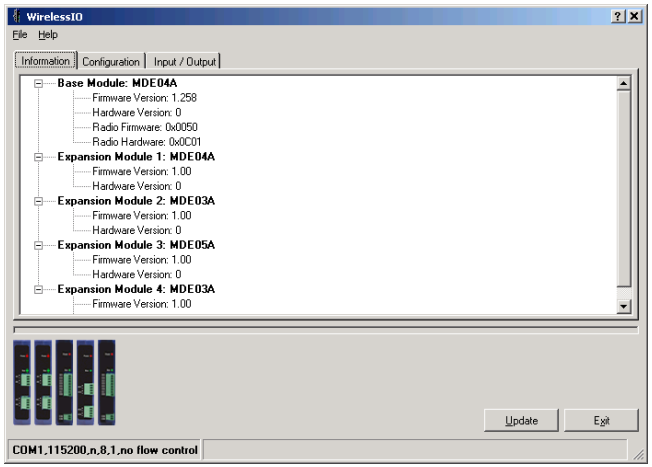


Figure 25. I/O Manager

The I/O Manager window contains:

- File and Help menus
- Three tabbed panes: Information, Configuration, and Input/Output
- A Help sidebar containing information and hints related to the current tab
- A graphic display of the Base and Expansion Modules discovered
- A Status bar (at the bottom) showing the COM port and communications parameters (baud rate, parity, data bits, stop bits and flow control)

- An Update button used to save configuration parameters to the modules.
- An Exit button.

Information Tab

The Information tab displays a tree structure listing:

- Base and Expansion modules detected and their model numbers
- Firmware version number for each module
- Hardware version number for each module
- Radio firmware version number for the Base Module
- Radio hardware version number for the Base Module

Configuration Tab

The Configuration tab contains fields that allow configuration of:

- Wireless (Radio) parameters: Region, Channel Number, Network Identifier and Repeater Mode
- Communications Modes: Peer-to-Peer Master, Peer-to-Peer Slave, Modbus (and related parameters)

Input/Output Tab

The Input/Output tab contains:

- A tree structure listing input and output types for each module
- Input and output configuration options

Chapter 4: Configuration & Operation

I/O Manager software is used to configure I/O hardware. Using I/O Manager, the system can be configured to operate in Peer-to-Peer (wire-replacement) or Modbus modes (receiving Modbus commands and data from a Modbus wireless modem). Digital inputs can be configured to operate in Discrete (on/off) or Frequency Counter modes and analog inputs and outputs are configurable for voltage or current loop operation.

Configuring I/O

I/O modules can be configured to operate as wireless Modbus nodes or as wire replacement links in Peer-to-Peer mode. Wireless configuration options are the same for either mode.

Wireless Settings

I/O Base Modules can be configured for operation in different geographic areas of the world. They can also be configured to operate on several different radio channels. This allows multiple I/O systems to operate in the same area without interference. The number of different systems can be further increased by configuring a unique Network Identifier (which selects the frequency hopping sequence). Base Modules also can be used as repeaters, to extend the range of a system.

To configure Wireless settings:

1. Select the **Configuration** tab.

2. In the **Region** drop down list, select the region in which you are operating: **Europe** or **Other**. The Region selection configures the radio to operate with the power output and other parameters appropriate for that region. The default Region selection is Europe, which limits power levels to those acceptable in that region.

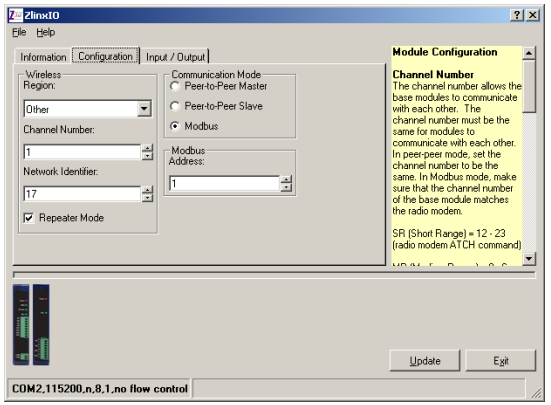

ZlinxIO
File Help
Information
Configuration
Input / Output
Wireless Region:
Other
Channel Number:
1
Network Identifier:
17
Repeater Mode
Communication Mode
Peer-to-Peer Master
Peer-to-Peer Slave
Modbus
Modbus Address:
1
Module Configuration
Channel Number
The channel number allows the base modules to communicate with each other. The channel number must be the same for modules to communicate with each other. In peer-peer mode, set the channel number to be the same. In Modbus mode, make sure that the channel number of the base module matches the radio modem.
SR (Short Range) = 12 - 23 (radio modem ATCH command)
Update
Exit
COM2,115200,n,8,1,no flow control

Figure 26. Wireless Area of Configuration Tab

3. Set the **Channel Number** field to match the channel used by the device with which it will communicate.

   a. If that device is another I/O Base Module, set the Channel Numbers the same when configuring each of them.

   b. If the device is a Modbus radio modem, the modem must be configured by using the correct AT command to match the Base Module's Channel Number.

   c. Each I/O radio type uses a different Channel Number range. Modbus radio modems use different AT commands depending on the radio type. The table below shows these ranges and commands.

Type/Range	Base Module Channel Number Range	Radio Modem AT Command
Short Range (SR)	12 to 23	ATCH
Medium Range (MR)	0 to 6	ATHP
Long Range (LR)	0 to 9	

Figure 27. Radio Types, Channel Numbers and AT Commands

The default value of the Channel Number field for SR radios is 12; the default for MR and LR radios is 0.

4. Set the **Network Identifier** field to match the Identifier used by the device with which it will communicate.

   a. If that device is another I/O Base Module, set the Network Identifiers the same when configuring each of them.

   b. If the device is a Modbus radio modem, the modem must be configured by using the correct AT command to match the Base Module's Network Identifier.

   c. Each I/O radio type uses a different Network Identifier range. Modbus radio modems must be configured to use the ATID command. The table below shows the channel number ranges.

Type/Range	Base Module Network Identifier Range	Radio Modem AT Command
Short Range (SR)	0 to 255	ATID
Medium Range (MR)	16 to 255	
Long Range (LR)	17 to 255	

Figure 28. Network ID Value Table

The default value of the Channel Number field for SR radios is 0; the default for MR radios is 16 and for LR radios is 17.

   d. For MR and LR radio modems, set the destination address (ATDT) to 0xFFFF.

5. Select the **Repeater** checkbox if the I/O Base Module is to be used as a repeater, re-broadcasting I/O data received in Modbus or Peer-to-Peer modes.

   The default value of the Repeater field is: unchecked.

Note: Repeater Mode can only be implemented on the medium range (MR) and long range (LR) Base Modules. The Repeater checkbox is not available when short range (SR) Base Modules.

Modbus Mode Settings

When configured as a wireless Modbus node, I/O communicates with a Wireless Modbus Modem and provides remote I/O functionality.

Refer to Appendix E for a list of which I/O Modbus modems are compatible with which I/O Base Modules.

When the I/O receives a Modbus message to write to a discrete output (0xxxx addresses in its memory map), the I/O module turns on its corresponding digital output. If a message containing holding register data is received (4xxxx addresses in its memory map), the I/O module converts the value to a voltage or current signal on the corresponding analog output.

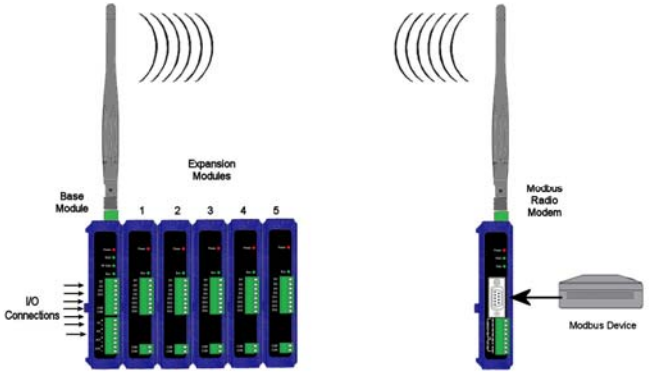


Figure 29. Modbus Mode

Digital and analog signals applied to the I/O module's input terminals are converted to Modbus messages to be sent back to the radio modem. Digital inputs are stored as 1xxxx (coil) addresses; analog inputs are converted to 12 bit binary values and stored in 3xxxx (input register) addresses.

To configure the I/O for Modbus mode:

1. Select the **Configuration** tab.

2. Select the **Modbus** option button.

3. In the **Modbus Address** box, type the Modbus address to be used.

   The allowable range of Modbus addresses is from 1 to 247. The default Modbus address is 1.

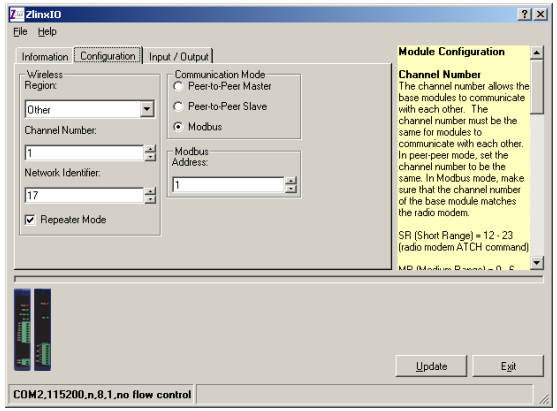

ZlinxIO
File Help
Information
Configuration
Input / Output
Wireless
Region:
Other
Channel Number:
1
Network Identifier:
17
Repeater Mode
Communication Mode
Peer-to-Peer Master
Peer-to-Peer Slave
Modbus
Modbus Address:
1
Module Configuration
Channel Number
The channel number allows the base modules to communicate with each other. The channel number must be the same for modules to communicate with each other. In peer-peer mode, set the channel number to be the same. In Modbus mode, make sure that the channel number of the base module matches the radio modem.
SR (Short Range) = 12 - 23 (radio modem ATCH command)
Update
Exit
COM2,115200,n,8,1,no flow control

Figure 30. Configuration Tab with Default Values

Peer-to-Peer Mode Settings

In Peer-to-Peer mode digital and analog signals can be transferred in both directions across a I/O link. For successful communication both Base Modules must be the same model and all Expansion Modules must be complimentary (e.g. DI to DO, AI to AO) and arranged in the same order on the Local Bus. One is configured as Peer-to-Peer Master and other is configured as Peer-to-Peer slave. It does not matter which one is configured as master. Additionally, Peer-to-Peer Master address MUST match the Peer-to-Peer Slave address (1-255).

Peer-to-Peer Master

To configure the I/O Base Module for Peer-to-Peer Master Mode:

1. Select the **Configuration** tab.

2. Select the **Peer-to-Peer Master** option button.

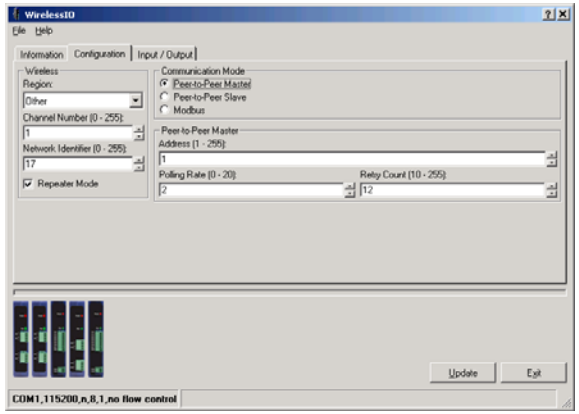


Figure 31. Peer-to-Peer Master Configuration

3. Set the Peer-to-Peer Master address from 1 to 255. Please note the Peer-to-Peer Slave address must also match.

4. The **Polling Rate** box contains the number of seconds between polls by the master. The default value of 1 second is usually satisfactory. The range of values is 0 to 20 seconds. If the I/O points are not updating properly, try increasing the value.

5. The **Retry Count** box contains the number of attempts that will be made to communicate with the slave device before the module indicates communication has been lost. Lost communication is indicated by the RF Data and Bus LED's blinking alternately. The default value of 10 is usually satisfactory. The range of values is 10 to 255.

Peer-to-Peer Slave

To configure the I/O Base Module for Peer-to-Peer Slave Mode:

1. Select the Configuration tab.

2. Select the Peer-to-Peer Slave option button...

3. Set the Peer-to-Peer Slave address from 1 to 255. Please note the Peer-to-Peer Master address must also match.

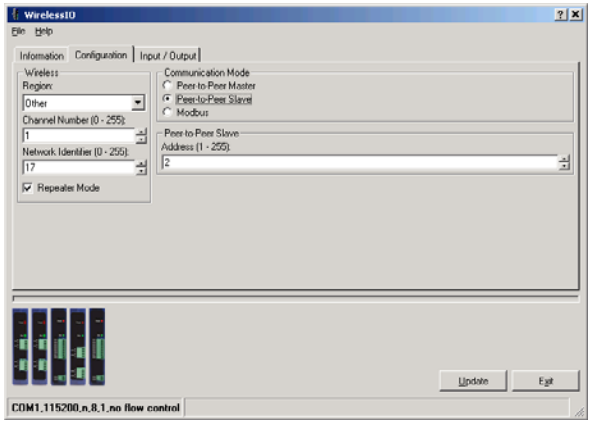


Figure 32. Peer-to-Peer Slave Configuration

Input/Output Settings

Digital inputs and analog inputs/outputs on I/O modules are configured from the Input/Output tab of the I/O Manager. The first two digital inputs on any module can be configured as Discrete inputs or Frequency Counter inputs. (Any additional digital inputs operate as Discrete inputs only.) Frequency Counter operation is only functional when the I/O is set up in Modbus mode. Analog inputs and outputs can be configured for voltage or current loop operation.

To configure digital and analog I/O:

1. Select the Input/Output tab.

   An input tree appears listing all Base and Expansion Modules in the system and the inputs available on them.

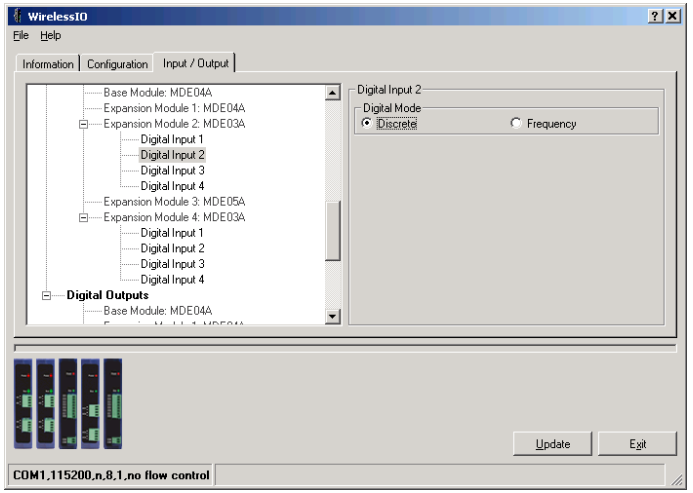


Figure 33. Digital Input Configuration

2. Select the Digital Input to be configured.

3. Select Discrete or Frequency Counter (for the first two inputs only). **Do NOT exceed 5 kHz for frequency input.**

   Setting the Digital Mode of either of the first two DI's to Frequency Mode sets both DI's on that module to the same mode. Do NOT exceed 5 kHz for frequency input.

4. Select the Analog Input to be configured.

5. Select the required Analog Mode (0 to 10 VDC or 0 to 20 mA).

Setting the Analog Mode of one AI or AO sets all AI's and AO's on that module to the same mode.

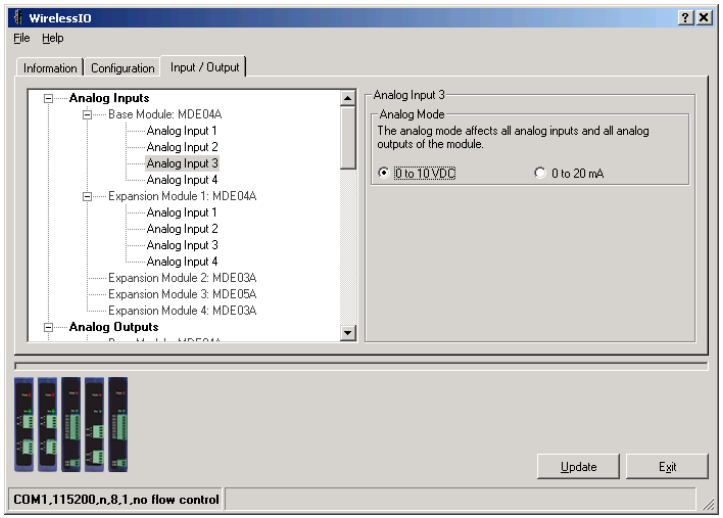


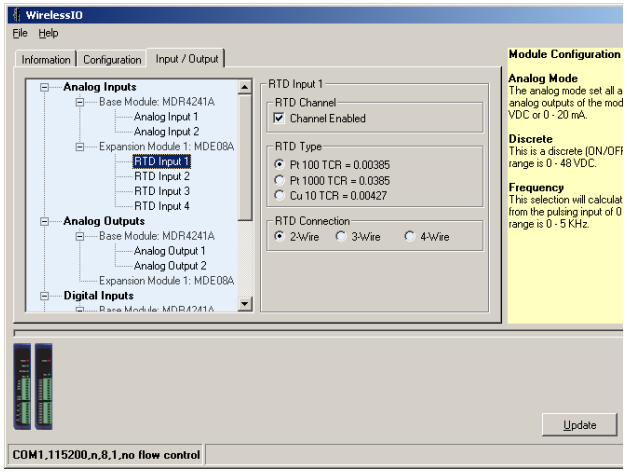
Figure 34. Analog Input Configuration

6. Select the Analog Output to be configured.

7. Select the required Analog Mode (0 to 10 VDC or 0 to 20 mA).

If RTD module present then,

1. Select the Input/Output tab.
   An input tree appears listing all Base and Expansion Modules in the system and the inputs available on them.



2. Select the RTD to be configured.

3. To increase speed, RTD channels may be turned on or off. If nothing is connected to the RTD channel, then uncheck the Channel Enabled option.

4. Select the RTD type as PT100, PT1000, CU10 depending on your RTD type.

5. Select if you have wired a 2, 3, or 4 wire RTD probe to the input module.

Setting the Analog Mode of one AI or AO sets all AI's and AO's on that module to the same mode.

Saving the Configuration

When all configuration settings are complete, click the Update button to save them in the I/O Base Module.

1. The Progress bar at the bottom of the windows shows the progress of the update.

2. The Status bar displays the following text:

```
Sending module parameters to the base module.
```

3. When the updating process is complete, the Status bar displays the message:

```
The configuration has been sent successfully.
```

Note: When configuration is complete, and the configuration has been saved, power can be removed from the Base Module and the MDP01 Programming Module disconnected and removed.

Updating I/O Firmware

Occasionally, updated firmware becomes available for I/O modules. When the I/O Manager software is installed on your computer the I/O Updater software is also installed. This can be used to update the firmware in your I/O modules. The following procedure describes the firmware updating process

1. Disconnect power from the Base Module.

2. Disconnect all modules from external equipment. (The easiest way to disconnect is to unplug all I/O terminal blocks.)

3. With power disconnected from the Base Module, plug the Programming Module into the Base Module.

4. Connect Expansion Modules requiring updates to the Base Module. (The male local bus connector on the first Expansion Module plugs into the female connector on the Base Module. The second Expansion Module plugs into the first, etc.)

5. Connect the PC serial port (COM 1 to 16) to the Programming Module using a straight-through serial (9 pin) cable.

6. From the Windows Start menu, start the I/O Firmware Updater software.

   The I/O Firmware Updater Caution dialog box appears.

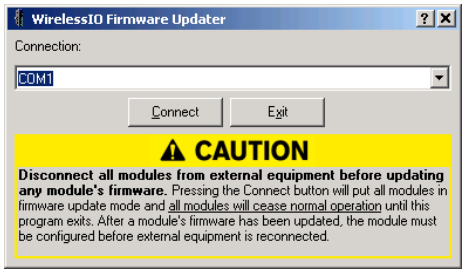

WirelessIO Firmware Updater
Connection:
COM1
Connect
Exit
CAUTION
Disconnect all modules from external equipment before updating any module's firmware. Pressing the Connect button will put all modules in firmware update mode and all modules will cease normal operation until this program exits. After a module's firmware has been updated, the module must be configured before external equipment is reconnected.

Figure 35. Firmware Updater Caution Dialog Box

7. Select the COM port from the Connection drop down list.

8. Click Connect.

9. Re-apply power to the I/O Base Module. The Power LED should light up.

10. The I/O Firmware Updater window opens and displays a list of the Base and Expansion Modules.

11. On the module list, select the Base or Expansion Module to be updated.

12. In the Firmware Image drop down box, select the image file (.hex).

13. Click the Program button to load the firmware into the module.

14. When all updates are complete, click Exit.

15. Before reconnecting the I/O, and before disconnecting the Programming Module, run the I/O Manager software and check to ensure all modules are configured properly.

16. When the configuration check is complete:

    a. exit the I/O Manager program

    b. disconnect power from the Base Module

    c. remove the Programming Module

    d. Reconnect the I/O.

    e. Re-connect power to the Base Module.

Testing Modbus Mode Operation

Using a Modbus radio modem, a PC and Modbus simulation software (e.g. Modscan) you can test the link and hardware, and investigate the operation of the I/O. Modscan is a Windows application that simulates a Modbus master node. You can read from and write to memory locations on the I/O. Modscan is available as a fully functional time-limited demo from www.win-tech.com

Appendix A: Default Configuration Settings

Wireless Region:	Europe
Wireless Channel Number:	12 for SR Base Modules 0 for MR and LR Base Modules
Wireless Network ID:	0 for SR Base Modules 16 for MR Base Modules 17 for LR Base Modules
Repeater Mode:	Not selected
Communication Mode:	Modbus
Modbus Address:	1
Digital Inputs:	Discrete
Analog Inputs:	0 to 10 VDC
Analog Outputs:	0 to 10 VDC

Appendix B: Product Specifications

Base Module Models:	MDR4241A, MDR4242A MDR4243A, MDR4244A MDR4901A, MDR4902A MDR4903A, MDR4904A
Expansion Module Models:	MDE04A, MDE05A, MDE06A, MDE01A,MDE02A, MDE03A, MDE07A, MDE08A
Manual:	Paper copy of this manual, PDF available
CD-ROM disc:	I/O Manager PDF of I/O User Manual PDF of Quick Start guide
Operating Systems supported:	Windows ME/98/2000/XP
Dimensions:	1.15 x 3.65 x 5 in (2.92 x 9.27x 12.7 cm)
Expansion Feature:	1 base module and up to 6 expansion modules
Radio Properties	
Short Range (SR) Option:	Up to 300 ft indoors / 1 mile outdoors (LOS)
Medium Range (MR) Option:	Up to 1500 ft indoors / 7 miles outdoors (LOS)
Long Range (LR) Option:	Up to 3000 ft indoors / 14 miles outdoors (LOS)
LED Indicators	
Receive Signal Strength Indicator:	Tri-color LED (Off = no signal, Red = weak, Yellow = OK, Green = Strong)
RF Data Indicator:	Green LED (blinks with TD or RD data traffic, Off = no data traffic)
Bus Indicator:	Green LED (blinks with TD or RD data traffic, Off = no data traffic)
Power Indicator:	Red LED
I/O Connectors:	Removable screw terminal (2, 4 or 8 position) block, 3.5 mm spacing
Digital Inputs	
Voltage Range:	0 to 48 VDC
Low Voltage (0):	0.8 V maximum

High Voltage (1):	4.0 V minimum
Pull up/down current:	38 uA
Frequency Input:	Two DI inputs per module software selectable as Frequency Counters, 0 to 5 kHz range (do NOT exceed more than 5kHz)
Digital Outputs	
Voltage Range:	10 to 45 VDC (for sourcing outputs), 0 to 48 VDC (for sinking outputs)
Open Source:	40 mA per output
Analog Inputs/Outputs	
Ranges:	0 to 10 VDC or 0 to 20 mA
Resolution:	12 bit
Input Accuracy:	0.2 % full scale reading typical, 0.5 % max
Output Accuracy:	0.27 % full scale reading typical, 0.63 % max
AI Load Resistance:	100 Mega ohms when configured for voltage input 250 ohms when configured for current input
AO Max Output Current:	1 mA when configured for voltage output
AO Max Source Load:	450 ohms when configured for current output
Input Protection:	Over-voltage to 2x max input voltage
Power Supply Voltage Requirements:	Sourcing modules: 10 VDC to 46 VDC, 24 VAC ±10% Sinking modules: 10 VDC to 48 VDC, 24 VAC ±10%
Power Supply:	Not included
Base Module Power Connector:	Removable screw terminal (2) block, 3.5 mm spacing
Relay Outputs	
Number of Relays:	8
Type:	C (normally open and normally closed)
Output Connection:	3.5mm removable terminal block (2 per output)
Common Connectin:	3.5mm removable terminal block (1 per bank of 4 output)
Ratings:	250 VAC @ 8A, 30 VDC @ 5A (maximum per bank of 4 as grouped on the label)
RTD Inputs	
Number of RTD:	4
Wire configuration:	2, 3, and 4 wire
Type:	PT100*, PT1000*, Cu10** *Optimized for temperature coefficient of 385

	**Optimized for temperature coefficient of 427
Input Connection:	3.5mm removable terminal block (4 per output)
Temperature Range:	PT100 = -200 to 650 º C PT1000 = -200 to 100 º C Cu10 = -100 to 260 º C
Resolution:	0.1 º C across -40 to 85 º C
Accuracy @ 25ºC:	±0.5ºC typical
Accuracy -40 to 85ºC:	±2.0ºC maximum
Power Consumption:	SR = 10W Max MR = 9.5W LR = 13.1W MDE04A = 1W MDE05A = 1.1W MDE06A = 1.2W MDE01A = 0.4W MDE02A = 15.8W MDE03A = 8.1W MDE07A = 3.2W MDE08A = 0.4W
Operating Temperature:	-40 to 80°C (-40 to 176 °F) -40 to 65ºC (-40 to 149 º F)
Storage Temperature:	-40 to 85 °C (-40 to 185 °F)
Humidity:	10% to 90% R.H. non-condensing
Enclosure Rating:	IP30
Mounting:	DIN rail mount, 35 mm
Certifications:	FCC: Part 15 Class A CISPR (EN55022) Class A EN61000-6-1 Generic Standards for Residential, Commercial & Light Industrial EN61000-4-2 ESD EN61000-4-3 RFI EN61000-4-4 EFT EN61000-4-5 Surge EN61000-4-6 CI EN61000-4-8 Power Frequency Magnetic EN61000-4-11 Voltage Dips & Interruptions
Accessories and Replacement Parts:	MDP02 Programming Module, serial cable, CD withI/0 Manager software and hardcopy of Quick Start Guide MDP01 Programming Module, serial cable, and hardcopy of Quick Start Guide

Programming Module MDP01	
Power Source:	Supplied through local bus connector from powered base module
Power Consumption:	5 VDC @ 40 mA max
LED Indicators:	Power ON: Red LED illuminated steady Local Bus: Data present on TD or RD line – Green LED blinks
Serial Connector:	DB-9F 9 pin D-type female connector (configured as DCE)
Interface Lines Supported:	RS-232 - TD, RD, RTS, CTS, DTR, DSR, DCD, GND
Serial Data Rates Supported:	115200 bps
Parity:	None
Data Bits:	8
Stop Bits:	1
Flow control:	None
Cable:	Gray straight-through DB9M to DB9F, 6 foot (included) – Part No. 9PAMF6
Local Bus Connection:	14 pin dual row 2mm connector
Temperature:	Operating: -40°C to 85°C Storage: -40°C to 85°C
Dimensions	1.15 x 3.65 x 5 in (2.92 x 9.27x 12.7 cm)
Operating Humidity:	10 to 90% non-condensing
Certifications:	FCC: Part 15 Class A CISPR (EN55022) Class A EN61000-6-1 Generic Standards for Residential, Commercial & Light Industrial EN61000-4-2 ESD EN61000-4-3 RFI EN61000-4-4 EFT EN61000-4-5 Surge EN61000-4-6 CI EN61000-4-8 Power Frequency Magnetic EN61000-4-11 Voltage Dips & Interruptions

Appendix C: Dimensional Diagrams

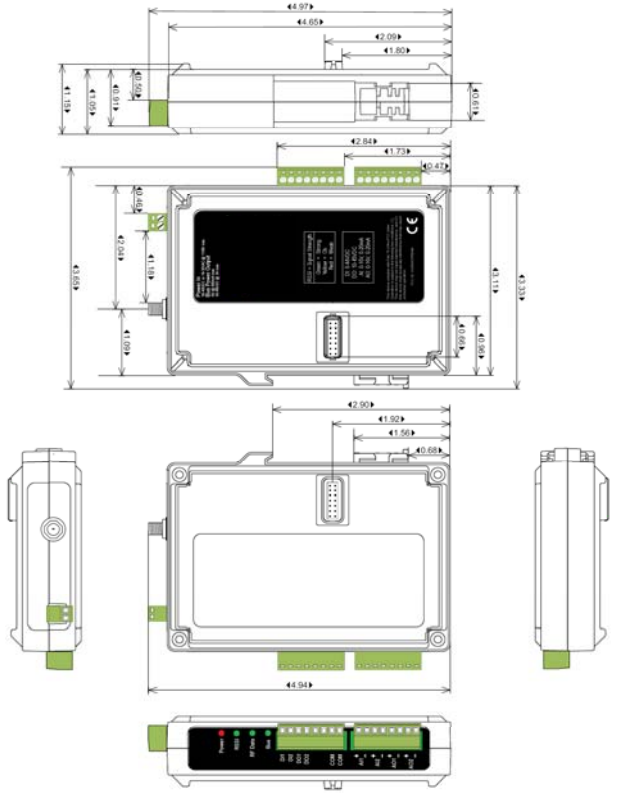


Figure 36. Dimensional Diagram of a I/O Base Module

Appendix D: Modbus I/O Assignments

00001-00112 Discrete Digital Outputs

Modbus function codes supported are:

Function 1: Read DO Status
Function 2: Read DI's
Function 3: Read AO Status
Function 4: Read AI's
Function 5: Write to Single DO (firmware v2.0 or higher)
Function 6: Write to Single AO
Function 15: Write to Multi DO's

Modbus Address	Description	#Bytes	Count	V Range
00001	Base Digital Output-1	-	0-1	Refer to Appendix B
00002	Base Digital Output-2	-	0-1	Refer to Appendix B
00003	Base Digital Output-3	-	0-1	Refer to Appendix B
00004	Base Digital Output-4	-	0-1	Refer to Appendix B
00005	Base Digital Output-5	-	0-1	Refer to Appendix B
00006	Base Digital Output-6	-	0-1	Refer to Appendix B
00007	Base Digital Output-7	-	0-1	Refer to Appendix B
00008	Base Digital Output-8	-	0-1	Refer to Appendix B
00009	Base Digital Output-9	-	0-1	Refer to Appendix B
00010	Base Digital Output-10	-	0-1	Refer to Appendix B
00011	Base Digital Output-11	-	0-1	Refer to Appendix B
00012	Base Digital Output-12	-	0-1	Refer to Appendix B
00013	Base Digital Output-13	-	0-1	Refer to Appendix B
00014	Base Digital Output-14	-	0-1	Refer to Appendix B
00015	Base Digital Output-15	-	0-1	Refer to Appendix B
00016	Base Digital Output-16	-	0-1	Refer to Appendix B
00017	EXP-1 Digital Output-1	-	0-1	Refer to Appendix B
00018	EXP-1 Digital Output-2	-	0-1	Refer to Appendix B
00019	EXP-1 Digital Output-3	-	0-1	Refer to Appendix B
00020	EXP-1 Digital Output-4	-	0-1	Refer to Appendix B
00021	EXP-1 Digital Output-5	-	0-1	Refer to Appendix B
00022	EXP-1 Digital Output-6	-	0-1	Refer to Appendix B
00023	EXP-1 Digital Output-7	-	0-1	Refer to Appendix B
00024	EXP-1 Digital Output-8	-	0-1	Refer to Appendix B
00025	EXP-1 Digital Output-9	-	0-1	Refer to Appendix B
00026	EXP-1 Digital Output-10	-	0-1	Refer to Appendix B
00027	EXP-1 Digital Output-11	-	0-1	Refer to Appendix B
00028	EXP-1 Digital Output-12	-	0-1	Refer to Appendix B
00029	EXP-1 Digital Output-13	-	0-1	Refer to Appendix B
00030	EXP-1 Digital Output-14	-	0-1	Refer to Appendix B
00031	EXP-1 Digital Output-15	-	0-1	Refer to Appendix B
00032	EXP-1 Digital Output-16	-	0-1	Refer to Appendix B
00033	EXP-2 Digital Output-1	-	0-1	Refer to Appendix B
00034	EXP-2 Digital Output-2	-	0-1	Refer to Appendix B
00035	EXP-2 Digital Output-3	-	0-1	Refer to Appendix B
00036	EXP-2 Digital Output-4	-	0-1	Refer to Appendix B
00037	EXP-2 Digital Output-5	-	0-1	Refer to Appendix B
00038	EXP-2 Digital Output-6	-	0-1	Refer to Appendix B
00039	EXP-2 Digital Output-7	-	0-1	Refer to Appendix B
00040	EXP-2 Digital Output-8	-	0-1	Refer to Appendix B
00041	EXP-2 Digital Output-9	-	0-1	Refer to Appendix B
00042	EXP-2 Digital Output-10	-	0-1	Refer to Appendix B
00043	EXP-2 Digital Output-11	-	0-1	Refer to Appendix B

Modbus Address	Description	#Bytes	Count	V Range
00044	EXP-2 Digital Output-12	-	0-1	Refer to Appendix B
00045	EXP-2 Digital Output-13	-	0-1	Refer to Appendix B
00046	EXP-2 Digital Output-14	-	0-1	Refer to Appendix B
00047	EXP-2 Digital Output-15	-	0-1	Refer to Appendix B
00048	EXP-2 Digital Output-16	-	0-1	Refer to Appendix B
00049	EXP-3 Digital Output-1	-	0-1	Refer to Appendix B
00050	EXP-3 Digital Output-2	-	0-1	Refer to Appendix B
00051	EXP-3 Digital Output-3	-	0-1	Refer to Appendix B
00052	EXP-3 Digital Output-4	-	0-1	Refer to Appendix B
00053	EXP-3 Digital Output-5	-	0-1	Refer to Appendix B
00054	EXP-3 Digital Output-6	-	0-1	Refer to Appendix B
00055	EXP-3 Digital Output-7	-	0-1	Refer to Appendix B
00056	EXP-3 Digital Output-8	-	0-1	Refer to Appendix B
00057	EXP-3 Digital Output-9	-	0-1	Refer to Appendix B
00058	EXP-3 Digital Output-10	-	0-1	Refer to Appendix B
00059	EXP-3 Digital Output-11	-	0-1	Refer to Appendix B
00060	EXP-3 Digital Output-12	-	0-1	Refer to Appendix B
00061	EXP-3 Digital Output-13	-	0-1	Refer to Appendix B
00062	EXP-3 Digital Output-14	-	0-1	Refer to Appendix B
00063	EXP-3 Digital Output-15	-	0-1	Refer to Appendix B
00064	EXP-3 Digital Output-16	-	0-1	Refer to Appendix B
00065	EXP-4 Digital Output-1	-	0-1	Refer to Appendix B
00066	EXP-4 Digital Output-2	-	0-1	Refer to Appendix B
00067	EXP-4 Digital Output-3	-	0-1	Refer to Appendix B
00068	EXP-4 Digital Output-4	-	0-1	Refer to Appendix B
00069	EXP-4 Digital Output-5	-	0-1	Refer to Appendix B
00070	EXP-4 Digital Output-6	-	0-1	Refer to Appendix B
00071	EXP-4 Digital Output-7	-	0-1	Refer to Appendix B
00072	EXP-4 Digital Output-8	-	0-1	Refer to Appendix B
00073	EXP-4 Digital Output-9	-	0-1	Refer to Appendix B
00074	EXP-4 Digital Output-10	-	0-1	Refer to Appendix B
00075	EXP-4 Digital Output-11	-	0-1	Refer to Appendix B
00076	EXP-4 Digital Output-12	-	0-1	Refer to Appendix B
00077	EXP-4 Digital Output-13	-	0-1	Refer to Appendix B
00078	EXP-4 Digital Output-14	-	0-1	Refer to Appendix B
00079	EXP-4 Digital Output-15	-	0-1	Refer to Appendix B
00080	EXP-4 Digital Output-16	-	0-1	Refer to Appendix B
00081	EXP-5 Digital Output-1	-	0-1	Refer to Appendix B
00082	EXP-5 Digital Output-2	-	0-1	Refer to Appendix B
00083	EXP-5 Digital Output-3	-	0-1	Refer to Appendix B
00084	EXP-5 Digital Output-4	-	0-1	Refer to Appendix B
00085	EXP-5 Digital Output-5	-	0-1	Refer to Appendix B
00086	EXP-5 Digital Output-6	-	0-1	Refer to Appendix B
00087	EXP-5 Digital Output-7	-	0-1	Refer to Appendix B
00088	EXP-5 Digital Output-8	-	0-1	Refer to Appendix B
00089	EXP-5 Digital Output-9	-	0-1	Refer to Appendix B
00090	EXP-5 Digital Output-10	-	0-1	Refer to Appendix B
00091	EXP-5 Digital Output-11	-	0-1	Refer to Appendix B
00092	EXP-5 Digital Output-12	-	0-1	Refer to Appendix B
00093	EXP-5 Digital Output-13	-	0-1	Refer to Appendix B
00094	EXP-5 Digital Output-14	-	0-1	Refer to Appendix B
00095	EXP-5 Digital Output-15	-	0-1	Refer to Appendix B
00096	EXP-5 Digital Output-16	1	0-1	Refer to Appendix B
00097	EXP-6 Digital Output-1	-	0-1	Refer to Appendix B

Modbus Address	Description	#Bytes	Count	V Range
00098	EXP-6 Digital Output-2	-	0-1	Refer to Appendix B
00099	EXP-6 Digital Output-3	-	0-1	Refer to Appendix B
00100	EXP-6 Digital Output-4	-	0-1	Refer to Appendix B
00101	EXP-6 Digital Output-5	-	0-1	Refer to Appendix B
00102	EXP-6 Digital Output-6	-	0-1	Refer to Appendix B
00103	EXP-6 Digital Output-7	-	0-1	Refer to Appendix B
00104	EXP-6 Digital Output-8	-	0-1	Refer to Appendix B
00105	EXP-6 Digital Output-9	-	0-1	Refer to Appendix B
00106	EXP-6 Digital Output-10	-	0-1	Refer to Appendix B
00107	EXP-6 Digital Output-11	-	0-1	Refer to Appendix B
00108	EXP-6 Digital Output-12	-	0-1	Refer to Appendix B
00109	EXP-6 Digital Output-13	-	0-1	Refer to Appendix B
00110	EXP-6 Digital Output-14	-	0-1	Refer to Appendix B
00111	EXP-6 Digital Output-15	-	0-1	Refer to Appendix B
00112	EXP-6 Digital Output-16	-	0-1	Refer to Appendix B

10001-10112 Discrete Digital Inputs

Modbus Address	Description	#Bytes	Count	V Range
10001	Base Digital Input-1	-	0-1	Refer to Appendix B
10002	Base Digital Input-2	-	0-1	Refer to Appendix B
10003	Base Digital Input-3	-	0-1	Refer to Appendix B
10004	Base Digital Input-4	-	0-1	Refer to Appendix B
10005	Base Digital Input-5	-	0-1	Refer to Appendix B
10006	Base Digital Input-6	-	0-1	Refer to Appendix B
10007	Base Digital Input-7	-	0-1	Refer to Appendix B
10008	Base Digital Input-8	-	0-1	Refer to Appendix B
10009	Base Digital Input-9	-	0-1	Refer to Appendix B
10010	Base Digital Input-10	-	0-1	Refer to Appendix B
10011	Base Digital Input-11	-	0-1	Refer to Appendix B
10012	Base Digital Input-12	-	0-1	Refer to Appendix B
10013	Base Digital Input-13	-	0-1	Refer to Appendix B
10014	Base Digital Input-14	-	0-1	Refer to Appendix B
10015	Base Digital Input-15	-	0-1	Refer to Appendix B
10016	Base Digital Input-16	-	0-1	Refer to Appendix B
10017	EXP-1 Digital Input-1	-	0-1	Refer to Appendix B
10018	EXP-1 Digital Input-2	-	0-1	Refer to Appendix B
10019	EXP-1 Digital Input-3	-	0-1	Refer to Appendix B
10020	EXP-1 Digital Input-4	-	0-1	Refer to Appendix B
10021	EXP-1 Digital Input-5	-	0-1	Refer to Appendix B
10022	EXP-1 Digital Input-6	-	0-1	Refer to Appendix B
10023	EXP-1 Digital Input-7	-	0-1	Refer to Appendix B
10024	EXP-1 Digital Input-8	-	0-1	Refer to Appendix B
10025	EXP-1 Digital Input-9	-	0-1	Refer to Appendix B
10026	EXP-1 Digital Input-10	-	0-1	Refer to Appendix B
10027	EXP-1 Digital Input-11	-	0-1	Refer to Appendix B
10028	EXP-1 Digital Input-12	-	0-1	Refer to Appendix B
10029	EXP-1 Digital Input-13	-	0-1	Refer to Appendix B
10030	EXP-1 Digital Input-14	-	0-1	Refer to Appendix B
10031	EXP-1 Digital Input-15	-	0-1	Refer to Appendix B
10032	EXP-1 Digital Input-16	-	0-1	Refer to Appendix B
10033	EXP-2 Digital Input-1	-	0-1	Refer to Appendix B
10034	EXP-2 Digital Input-2	-	0-1	Refer to Appendix B
10035	EXP-2 Digital Input-3	-	0-1	Refer to Appendix B
10036	EXP-2 Digital Input-4	-	0-1	Refer to Appendix B
10037	EXP-2 Digital Input-5	-	0-1	Refer to Appendix B
10038	EXP-2 Digital Input-6	-	0-1	Refer to Appendix B

Modbus Address	Description	#Bytes	Count	V Range
10039	EXP-2 Digital Input-7	-	0-1	Refer to Appendix B
10040	EXP-2 Digital Input-8	-	0-1	Refer to Appendix B
10041	EXP-2 Digital Input-9	-	0-1	Refer to Appendix B
10042	EXP-2 Digital Input-10	-	0-1	Refer to Appendix B
10043	EXP-2 Digital Input-11	-	0-1	Refer to Appendix B
10044	EXP-2 Digital Input-12	-	0-1	Refer to Appendix B
10045	EXP-2 Digital Input-13	-	0-1	Refer to Appendix B
10046	EXP-2 Digital Input-14	-	0-1	Refer to Appendix B
10047	EXP-2 Digital Input-15	-	0-1	Refer to Appendix B
10048	EXP-2 Digital Input-16	-	0-1	Refer to Appendix B
10049	EXP-3 Digital Input-1	-	0-1	Refer to Appendix B
10050	EXP-3 Digital Input-2	-	0-1	Refer to Appendix B
11051	EXP-3 Digital Input-3	-	0-1	Refer to Appendix B
10052	EXP-3 Digital Input-4	-	0-1	Refer to Appendix B
10053	EXP-3 Digital Input-5	-	0-1	Refer to Appendix B
10054	EXP-3 Digital Input-6	-	0-1	Refer to Appendix B
10055	EXP-3 Digital Input-7	-	0-1	Refer to Appendix B
10056	EXP-3 Digital Input-8	-	0-1	Refer to Appendix B
10057	EXP-3 Digital Input-9	-	0-1	Refer to Appendix B
10058	EXP-3 Digital Input-10	-	0-1	Refer to Appendix B
10059	EXP-3 Digital Input-11	-	0-1	Refer to Appendix B
10060	EXP-3 Digital Input-12	-	0-1	Refer to Appendix B
10061	EXP-3 Digital Input-13	-	0-1	Refer to Appendix B
10062	EXP-3 Digital Input-14	-	0-1	Refer to Appendix B
10063	EXP-3 Digital Input-15	-	0-1	Refer to Appendix B
10064	EXP-3 Digital Input-16	-	0-1	Refer to Appendix B
10065	EXP-4 Digital Input-1	-	0-1	Refer to Appendix B
10066	EXP-4 Digital Input-2	-	0-1	Refer to Appendix B
10067	EXP-4 Digital Input-3	-	0-1	Refer to Appendix B
10068	EXP-4 Digital Input-4	-	0-1	Refer to Appendix B
10069	EXP-4 Digital Input-5	-	0-1	Refer to Appendix B
10070	EXP-4 Digital Input-6	-	0-1	Refer to Appendix B
10071	EXP-4 Digital Input-7	-	0-1	Refer to Appendix B
10072	EXP-4 Digital Input-8	-	0-1	Refer to Appendix B
10073	EXP-4 Digital Input-9	-	0-1	Refer to Appendix B
10074	EXP-4 Digital Input-10	-	0-1	Refer to Appendix B
10075	EXP-4 Digital Input-11	-	0-1	Refer to Appendix B
10076	EXP-4 Digital Input-12	-	0-1	Refer to Appendix B
10077	EXP-4 Digital Input-13	-	0-1	Refer to Appendix B
10078	EXP-4 Digital Input-14	-	0-1	Refer to Appendix B
10079	EXP-4 Digital Input-15	-	0-1	Refer to Appendix B
10080	EXP-4 Digital Input-16	-	0-1	Refer to Appendix B
10081	EXP-5 Digital Input-1	-	0-1	Refer to Appendix B
10082	EXP-5 Digital Input-2	-	0-1	Refer to Appendix B
10083	EXP-5 Digital Input-3	-	0-1	Refer to Appendix B
10084	EXP-5 Digital Input-4	-	0-1	Refer to Appendix B
10085	EXP-5 Digital Input-5	-	0-1	Refer to Appendix B
10086	EXP-5 Digital Input-6	-	0-1	Refer to Appendix B
10087	EXP-5 Digital Input-7	-	0-1	Refer to Appendix B
10088	EXP-5 Digital Input-8	-	0-1	Refer to Appendix B
10089	EXP-5 Digital Input-9	-	0-1	Refer to Appendix B
10090	EXP-5 Digital Input-10	-	0-1	Refer to Appendix B
10091	EXP-5 Digital Input-11	-	0-1	Refer to Appendix B

Modbus Address	Description	#Bytes	Count	V Range
10092	EXP-5 Digital Input-12	-	0-1	Refer to Appendix B
10093	EXP-5 Digital Input-13	-	0-1	Refer to Appendix B
10094	EXP-5 Digital Input-14	-	0-1	Refer to Appendix B
10095	EXP-5 Digital Input-15	-	0-1	Refer to Appendix B
10096	EXP-5 Digital Input-16	-	0-1	Refer to Appendix B
10097	EXP-6 Digital Input-1	-	0-1	Refer to Appendix B
10098	EXP-6 Digital Input-2	-	0-1	Refer to Appendix B
10099	EXP-6 Digital Input-3	-	0-1	Refer to Appendix B
10100	EXP-6 Digital Input-4	-	0-1	Refer to Appendix B
10101	EXP-6 Digital Input-5	-	0-1	Refer to Appendix B
10102	EXP-6 Digital Input-6	-	0-1	Refer to Appendix B
10103	EXP-6 Digital Input-7	-	0-1	Refer to Appendix B
10104	EXP-6 Digital Input-8	-	0-1	Refer to Appendix B
10105	EXP-6 Digital Input-9	-	0-1	Refer to Appendix B
10106	EXP-6 Digital Input-10	-	0-1	Refer to Appendix B
10107	EXP-6 Digital Input-11	-	0-1	Refer to Appendix B
10108	EXP-6 Digital Input-12	-	0-1	Refer to Appendix B
10109	EXP-6 Digital Input-13	-	0-1	Refer to Appendix B
10110	EXP-6 Digital Input-14	-	0-1	Refer to Appendix B
10111	EXP-6 Digital Input-15	-	0-1	Refer to Appendix B
10112	EXP-6 Digital Input-16	-	0-1	Refer to Appendix B

30001-30112 Analog Inputs

Modbus Address	Description	#Bytes	A/D Count	(V)/(I)Range
30001	Base Analog Input-1	2	0-4095	0-10vdc/0-20ma
30002	Base Analog Input-2	2	0-4095	0-10vdc/0-20ma
30003	Base Analog Input-3	2	0-4095	0-10vdc/0-20ma
30004	Base Analog Input-4	2	0-4095	0-10vdc/0-20ma
30005	Base Analog Input-5	2	0-4095	0-10vdc/0-20ma
30006	Base Analog Input-6	2	0-4095	0-10vdc/0-20ma
30007	Base Analog Input-7	2	0-4095	0-10vdc/0-20ma
30008	Base Analog Input-8	2	0-4095	0-10vdc/0-20ma
30009	System Input Power	2	0-1023	0-48vdc
30010	Base Reserved	-	-	-
30011	Base Reserved	-	-	-
30012	Base Reserved	-	-	-
30013	Base Reserved	-	-	-
30014	Base Reserved	-	-	-
30015	Base Reserved	-	-	-
30016	Base Reserved	-	-	-
30017	EXP-1 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30018	EXP-1 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30019	EXP-1 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30020	EXP-1 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30021	EXP-1 Analog Input-5	2	0-4095	0-10vdc/0-20ma
30022	EXP-1 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30023	EXP-1 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30024	EXP-1 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30025	EXP-1 Reserved	-	-	-
30026	EXP-1 Reserved	-	-	-
30027	EXP-1 Reserved	-	-	-
30028	EXP-1 Reserved	-	-	-
30029	EXP-1 Reserved	-	-	-
30030	EXP-1 Reserved	-	-	-
30031	EXP-1 Reserved	-	-	-
30032	EXP-1 Reserved	-	-	-

Modbus Address	Description	#Bytes	A/D Count	(V)/(I)Range
30033	EXP-2 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30034	EXP-2 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30035	EXP-2 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30036	EXP-2 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30037	EXP-2 Analog Input-5	2	0-4095	0-10vdc/0-20ma
30038	EXP-2 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30039	EXP-2 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30040	EXP-2 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30041	EXP-2 Reserved	-	-	-
30042	EXP-2 Reserved	-	-	-
30043	EXP-2 Reserved	-	-	-
30044	EXP-2 Reserved	-	-	-
30045	EXP-2 Reserved	-	-	-
30046	EXP-2 Reserved	-	-	-
30047	EXP-2Reserved	-	-	-
30048	EXP-2 Reserved	-	-	-
30049	EXP-3 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30050	EXP-3 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30051	EXP-3 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30052	EXP-3 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30053	EXP-3 Analog Input-5	2	0-4095	0-10vdc/0-20ma
30054	EXP-3 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30055	EXP-3 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30056	EXP-3 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30057	EXP-3 Reserved	-	-	-
30058	EXP-3 Reserved	-	-	-
30059	EXP-3 Reserved	-	-	-
30060	EXP-3 Reserved	-	-	-
30061	EXP-3 Reserved	-	-	-
30062	EXP-3 Reserved	-	-	-
30063	EXP-3Reserved	-	-	-
30064	EXP-3 Reserved	-	-	-
30065	EXP-4 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30066	EXP-4 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30067	EXP-4 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30068	EXP-4 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30069	EXP-4 Analog Input-5	2	0-4095	0-10vdc/0-20ma
30070	EXP-4 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30071	EXP-4 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30072	EXP-4 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30073	EXP-4 Reserved	-	-	-
30074	EXP-4 Reserved	-	-	-
30075	EXP-4 Reserved	-	-	-
30076	EXP-4 Reserved	-	-	-
30077	EXP-4 Reserved	-	-	-
30078	EXP-4 Reserved	-	-	-
30079	EXP-4Reserved	-	-	-
30080	EXP-4 Reserved	-	-	-
30081	EXP-5 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30082	EXP-5 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30083	EXP-5 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30084	EXP-5 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30085	EXP-5 Analog Input-5	2	0-4095	0-10vdc/0-20ma

Modbus Address	Description	#Bytes	A/D Count	(V)/(I)Range
30086	EXP-5 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30087	EXP-5 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30088	EXP-5 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30089	EXP-5 Reserved	-	-	-
30090	EXP-5 Reserved	-	-	-
30091	EXP-5 Reserved	-	-	-
30092	EXP-5 Reserved	-	-	-
30093	EXP-5 Reserved	-	-	-
30094	EXP-5 Reserved	-	-	-
30095	EXP-5Reserved	-	-	-
30096	EXP-5 Reserved	-	-	-
30097	EXP-6 Analog Input-1	2	0-4095	0-10vdc/0-20ma
30098	EXP-6 Analog Input-2	2	0-4095	0-10vdc/0-20ma
30099	EXP-6 Analog Input-3	2	0-4095	0-10vdc/0-20ma
30100	EXP-6 Analog Input-4	2	0-4095	0-10vdc/0-20ma
30101	EXP-6 Analog Input-5	2	0-4095	0-10vdc/0-20ma
30102	EXP-6 Analog Input-6	2	0-4095	0-10vdc/0-20ma
30103	EXP-6 Analog Input-7	2	0-4095	0-10vdc/0-20ma
30104	EXP-6 Analog Input-8	2	0-4095	0-10vdc/0-20ma
30105	EXP-6 Reserved	-	-	-
30106	EXP-6 Reserved	-	-	-
30107	EXP-6 Reserved	-	-	-
30108	EXP-6 Reserved	-	-	-
30109	EXP-6 Reserved	-	-	-
30110	EXP-6 Reserved	-	-	-
30111	EXP-6Reserved	-	-	-
30112	EXP-6 Reserved	-	-	-

40001-40112 Analog Outputs/Special Registers

Modbus Address	Description	#Bytes	D/A Count	(V)/(I)Range
40001	Base Analog Output-1	2	0-4095	0-10vdc/0-20ma
40002	Base Analog Output-2	2	0-4095	0-10vdc/0-20ma
40003	Base Analog Output-3	2	0-4095	0-10vdc/0-20ma
40004	Base Analog Output-4	2	0-4095	0-10vdc/0-20ma
40005	Base Analog Output-5	2	0-4095	0-10vdc/0-20ma
40006	Base Analog Output-6	2	0-4095	0-10vdc/0-20ma
40007	Base Analog Output-7	2	0-4095	0-10vdc/0-20ma
40008	Base Analog Output-8	2	0-4095	0-10vdc/0-20ma
40009	Base Freq Input – 1	2	0-5000	-
40010	Base Freq Input – 2	2	0-5000	-
40011	Base Freq Input – 3	2	0-5000	-
40012	Base Freq Input – 4	2	0-5000	-
40013	Base Address	2	0-1023	-
40014	Local COM Comm Status	2	Bit Map	-
40015	Number Of Local COM Devices	-	-	-
40016	Base Reserved	-	-	-
40017	EXP-1 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40018	EXP-1 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40019	EXP-1 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40020	EXP-1 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40021	EXP-1 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40022	EXP-1 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40023	EXP-1 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40024	EXP-1 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40025	EXP-1 Freq Input – 1	2	0-5000	-
40026	EXP-1 Freq Input – 2	2	0-5000	-
40027	EXP-1 Freq Input – 3	2	0-5000	-

Modbus Address	Description	#Bytes	D/A Count	(V)/(I)Range
40028	EXP-1 Freq Input – 4	2	0-5000	-
40029	EXP-1 Address	2	0-1023	
40030	EXP-1 Reserved	-	-	-
40031	EXP-1 Reserved	-	-	-
40032	EXP-1 Reserved	-	-	-
40033	EXP-2 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40034	EXP-2 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40035	EXP-2 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40036	EXP-2 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40037	EXP-2 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40038	EXP-2 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40039	EXP-2 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40040	EXP-2 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40041	EXP-2 Freq Input – 1	2	0-5000	-
40042	EXP-2 Freq Input – 2	2	0-5000	-
40043	EXP-2 Freq Input – 3	2	0-5000	-
40044	EXP-2 Freq Input – 4	2	0-5000	-
40045	EXP-2 Address	2	0-1023	
40046	EXP-2 Reserved	-	-	-
40047	EXP-2 Reserved	-	-	-
40048	EXP-2 Reserved	-	-	-
40049	EXP-3 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40050	EXP-3 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40051	EXP-3 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40052	EXP-3 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40053	EXP-3 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40054	EXP-3 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40055	EXP-3 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40056	EXP-3 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40057	EXP-3 Freq Input – 1	2	0-5000	-
40058	EXP-3 Freq Input – 2	2	0-5000	-
40059	EXP-3 Freq Input – 3	2	0-5000	-
40060	EXP-3 Freq Input – 4	2	0-5000	-
40061	EXP-3 Address	2	0-1023	
40062	EXP-3 Reserved	-	-	-
40063	EXP-3 Reserved	-	-	-
40064	EXP-3 Reserved	-	-	-
40065	EXP-4 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40066	EXP-4 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40067	EXP-4 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40068	EXP-4 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40069	EXP-4 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40070	EXP-4 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40071	EXP-4 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40072	EXP-4 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40073	EXP-4 Freq Input – 1	2	0-5000	-
40074	EXP-4 Freq Input – 2	2	0-5000	-
40075	EXP-4 Freq Input – 3	2	0-5000	-
40076	EXP-4 Freq Input – 4	2	0-5000	-
40077	EXP-4 Address	2	0-1023	
40078	EXP-4 Reserved	-	-	-
40079	EXP-4 Reserved	-	-	-
40080	EXP-4 Reserved	-	-	-

Modbus Address	Description	#Bytes	D/A Count	(V)/(I)Range
40081	EXP-5 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40082	EXP-5 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40083	EXP-5 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40084	EXP-5 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40085	EXP-5 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40086	EXP-5 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40087	EXP-5 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40088	EXP-5 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40089	EXP-5 Freq Input – 1	2	0-5000	-
40090	EXP-5 Freq Input – 2	2	0-5000	-
40091	EXP-5 Freq Input – 3	2	0-5000	-
40092	EXP-5 Freq Input – 4	2	0-5000	-
40093	EXP-5 Address	2	0-1023	
40094	EXP-5 Reserved	-	-	-
40095	EXP-5 Reserved	-	-	-
40096	EXP-5 Reserved	-	-	-
40097	EXP-6 Analog Output-1	2	0-4095	0-10vdc/0-20ma
40098	EXP-6 Analog Output-2	2	0-4095	0-10vdc/0-20ma
40099	EXP-6 Analog Output-3	2	0-4095	0-10vdc/0-20ma
40100	EXP-6 Analog Output-4	2	0-4095	0-10vdc/0-20ma
40101	EXP-6 Analog Output-5	2	0-4095	0-10vdc/0-20ma
40102	EXP-6 Analog Output-6	2	0-4095	0-10vdc/0-20ma
40103	EXP-6 Analog Output-7	2	0-4095	0-10vdc/0-20ma
40104	EXP-6 Analog Output-8	2	0-4095	0-10vdc/0-20ma
40105	EXP-6 Freq Input – 1	2	0-5000	-
40106	EXP-6 Freq Input – 2	2	0-5000	-
40107	EXP-6 Freq Input – 3	2	0-5000	-
40108	EXP-6 Freq Input – 4	2	0-5000	-
40109	EXP-6 Address	2	0-1023	
40110	EXP-6 Reserved	-	-	-
40111	EXP-6 Reserved	-	-	-
40112	EXP-6 Reserved	-	-	-

Appendix E: I/O Models and Features

Base Modules

Model Number	Module Type	Frequency/Range	I/O
MDR4241A	Base	2.4 GHz, short range	2AI, 2AO, 2DI, 2DO (sourcing DO's)
MDR4242A	Base	2.4 GHz, short range	4DI, 4DO (sourcing DO's)

Base/Repeater Modules

Model Number	Type	Frequency/Range	I/O
MDR4243A	Base/Repeater	2.4 GHz, medium range	2AI, 2AO, 2DI, 2DO (sourcing DO's)
MDR4244A	Base/Repeater	2.4 GHz, medium range	4DI, 4DO (sourcing DO's)
MDR4901A	Base/Repeater	900 MHz, medium range	2AI, 2AO, 2DI, 2DO (sourcing DO's)
MDR4902A	Base/Repeater	900 MHz, medium range	4DI, 4DO (sourcing DO's)
MDR4903A	Base/Repeater	900 MHz, long range	2AI, 2AO, 2DI, 2DO (sourcing DO's)
MDR4904A	Base/Repeater	900 MHz, long range	4DI, 4DO (sourcing DO's)

Expansion Modules

Model Number	Type	I/O	I/O Types
MDE04A	Analog Input Module	4AI	mA, V
MDE05A	Analog Output Module	4AO	mA, V
MDE06A	Analog Input/Output Module	2AI, 2AO	mA, V
MDE01A	Digital Input Module	8DI	Pull-up, R

MDE02A	Digital Output Module	8DO	sourcing
MDE03A	Digital Input/Output Module	4DI, 4DO	sourcing
MDE07A	Digital Output Module	8DO	relays
MDE08A	Analog Input Module	4AI	RTD

Compatible Radio Modems

Radio Modem Model	Description	I/O Base Module Model
MDR3243A	2.4 GHz RS-232/422/485 radio modem	MDR4241A MDR4242A
MDR3241A	2.4 GHz RS-232/422/485 radio modem 9600 bps	MDR4243A MDR4244A
MDR3901A	900 MHz RS-232/422/485 radio modem 9600 bps	MDR4901A MDR4902A
MDR3903A	900 MHz RS-232/422/485 radio modem 115.2 kbps	MDR4903A MDR4904A

Accessories

Model Number	Description
MDP01	Programming Module
MDP02	Programming Module and CD with I/O Manager software

Appendix F: I/O Troubleshooting

Problem	Causes
RSSI LED and RF Data LED intermittently blink	• Firmware does not match The firmware for all base modules must match and the firmware for all expansion modules must match. The firmware rev number may be viewed on the information tab of the configuration software. If the firmware does not match, then update the firware with the Firmware updater program.
	• No Peer-Peer communication link The communication link is not established. Verify that all parameters in the configuration tab in the programming software is correct. Make sure that there are no obstacles in the path of the wireless transmission.
	• Too many expansion modules installed Only 6 expansion modules may be connected to any base module.
	• Expansion modules in peer-peer mode do not match In peer-peer mode, the master and slave must have the same number of expansion modules.
	• Expansion module added/removed without cycling power on base module The I/O configures the base module and expansion modules on a cycle of power. No damage occurs by adding/removing a module "hot" but the power does need to be cycled for the base module to update the expansion locations.